data cyborgs

Constructing Datafied Relations, Week 7

So far…

- Cyborg and EoT framework for data science
  - View the entities involved as a collective.
  - *Authentic freedom*: Liberation through agency/meeting needs of all stakeholders (interior and exterior to cyborg).
- Data
  - Shaping the data environment of computational models.
    - Definition of categories in Umwelt.
    - Importance (what is and isn't measured).
    - Representation of concepts/entities as data.
  - Web-scraping.
- Models
  - Umwelt beyond data.
    - Task the model is built for.
    - Reduction to computational.
    - Optimization: Performance metrics, loss functions.
  - Machine Learning.

The data cyborg in the wild

Design-level:

- What is the intended use of the model?
  - Decision-making, storytelling, call-to-action, monitoring, understanding…
- How could the model/cyborg's Umwelt affect the way the model acts in the world?

Deployment:

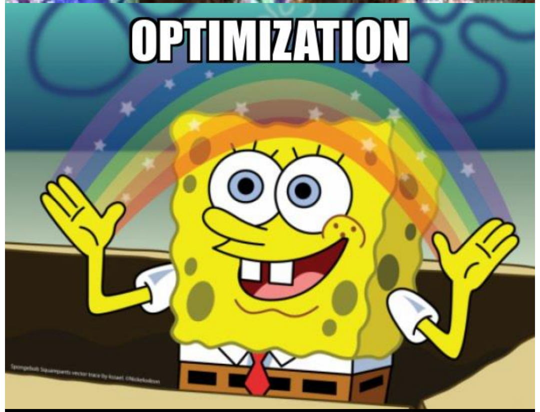
- How does the model/cyborg affect/relate to the world?
  - Automated, HCI, visualization, interface, data-environment, network…

Model Cyborg – Model + Implementer

Status Quo

Failure of authentic freedom.

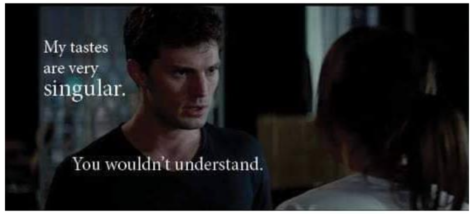
- Computer says no.
- Simplification/Reduction + Optimization.
- Escaping accountability through automated decisions.
- Algorithmic rails.
- Division of mind/body, individual/collective, human/nature.



Cyborg EoA

Authentic freedom.

- Respect for self-determination.
- Acknowledges ambiguity, limitations and choices in data and models. Does not treat as absolute truth.
- Cyborg decision-making with many stakeholders.
- Creating/enriching potential and choice.
- Stays with the trouble.



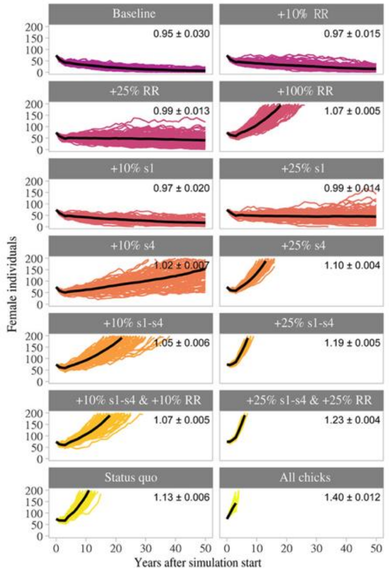
Management or event type	Specification	Quantification
Translocation & release	Release of zoo offspring by human-led migration	Mean annual release rate 2008–2019: 20.4 juveniles (range 10–30)
Reproduction improvement	Adults added temporarily to improve reproduction	Mean annual per cent of breeding pairs with participation of added adults: 38%; mean annual per cent of fledglings with parent added temporarily: 39%
Mortality reduction	Campaign against illegal hunting during the LIFE+ period (2014–2019)	Losses because of illegal hunting in Italy; 2008–2013: 40%; LIFE+ period: 17%; 59% reduction because of the LIFE+ campaign
Mortality reduction	Retrofitting of unsecure power poles in Germany implemented widely in 2016	Electrocution cases in Germany as proportion of all cases; 2008–2016: 41%; 2017–2019: 4%; 91% reduction because of the retrofitting measures
Stochastic event	Early onset of winter	Frequency: 18%; severity: c. 27% of migrating birds for stages 1 & 4
Stochastic event	Chick predation	Frequency: 9%; severity: c. 21% of the chicks in one breeding colony
Stochastic event	Infections	Frequency: 18%; severity: c. 4% of the population

SUPPLEMENTARY TABLE 3.5 Parameters used for the individual-based model in NetLogo. Parameters are described with their definition, baseline value in the simulation (baseline scenario), other possible values (in different combinations in the other scenarios) and unit. In brackets in the column default value: standard deviation (SD).

Name	Definition	Baseline value (±SD)	Other possible values	Unit
Number_Juveniles	Number of female individuals in Stage 1	37	-	Number
Number_Subadults_Age1	Number of female individuals in Stage 2	11	-	Number
Number_Subadults_Age2	Number of female individuals in Stage 3	8	-	Number
Number_Adults	Number of female individuals in Stage 4	18	-	Number
Mortality_Juveniles	Mortality probability of individuals in Stage 1 (s1)	0.36 (±0.36)	0.20, 0.30	
Mortality_Subadults_Age1	Mortality probability of individuals in Stage 2 (s2)	0.26 (±0.35)	0.08, 0.19	
Mortality_Subadults_Age2	Mortality probability of individuals in Stage 3 (s3)	0.31 (±0.35)	0.14, 0.24	
Mortality_Adults	Mortality probability of individuals in Stage 4 (s4)	0.22 (±0.14)	0.02, 0.14	
Repro_Rate	Probability to hatch a chick	0.53(±0.17)	0.58, 0.66, 1.06, 1.41, 3.97	

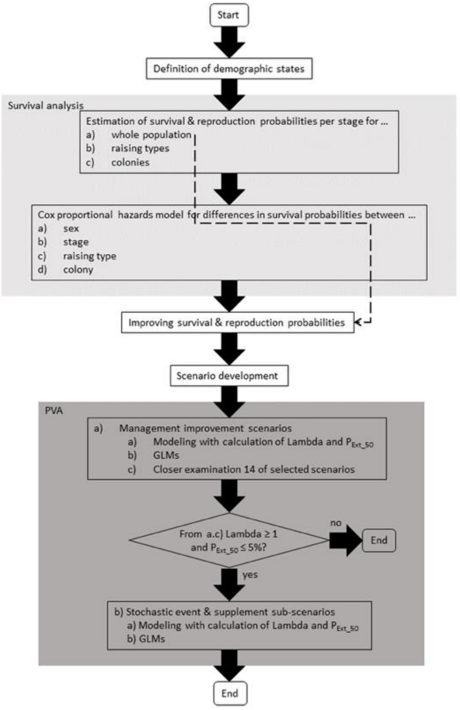
Case Study: Predicting Bird Survival

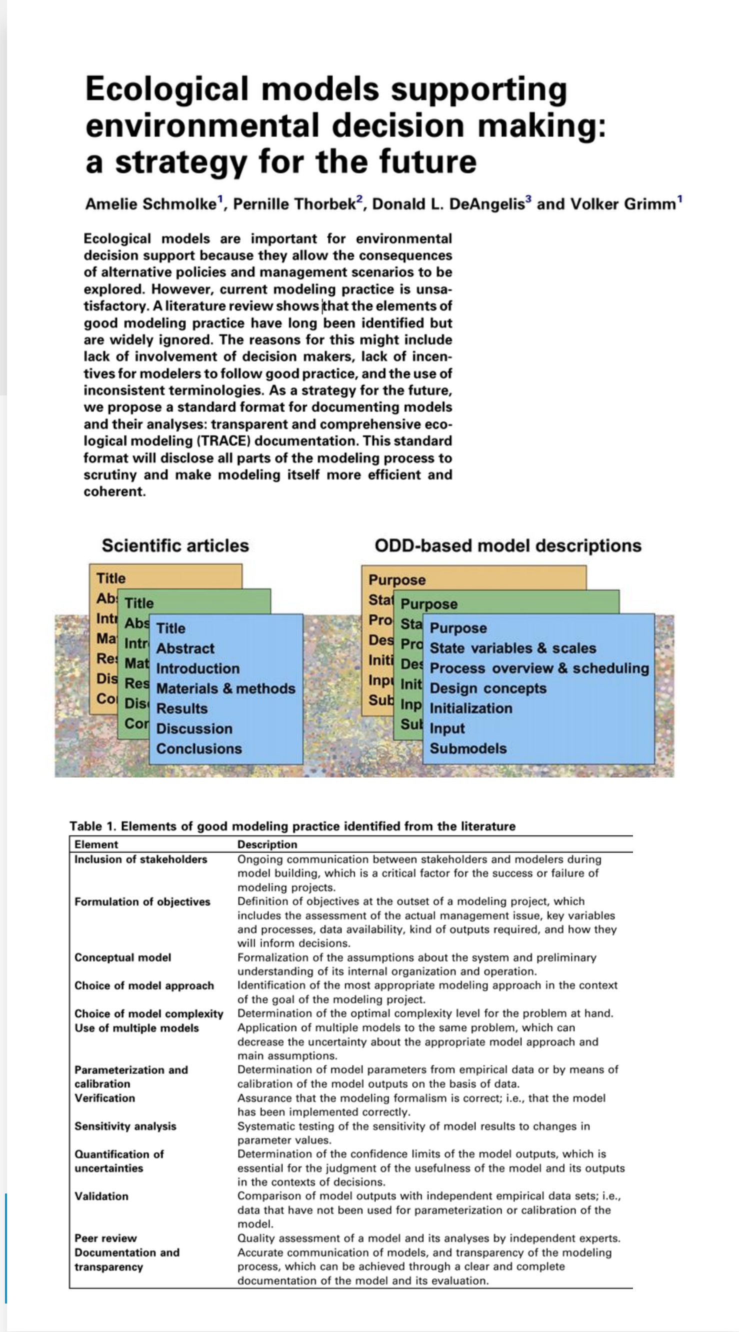
- *Stated purpose*: Investigate if reintroduced NBI population is viable.
- *Model:* Predict extinction within next 50 years.
- *Data:* Population numbers, survival rates and reproduction rates (Female only, 2008-2019).
- *Stochastic events:* Storms/droughts modeled as random increases in mortality.
- *Management strategies:* Changes to input variables that could improve survival chances.
- **Results:** *Rejecting hypothesis that population is self-sustaining*. Follow-up LIFE project with action against poaching and electrocution, bringing numbers up to modeled sustainable levels.



On the road to self-sustainability: reintroduced migratory European northern bald ibises *Geronticus eremita* still need management interventions for population viability

SINAH DRENSKE, VIKTORIIA RADCHUK, CÉDRIC SCHERER, CORINNA ESTERER
INGO KOWARIK, JOHANNES FRITZ and STEPHANIE KRAMER-SCHADT





Ecological models supporting environmental decision making: a strategy for the future

Amelie Schmolke[1], Pernille Thorbek[2], Donald L. DeAngelis[3] and Volker Grimm[1]

Ecological models are important for environmental decision support because they allow the consequences of alternative policies and management scenarios to be explored. However, current modeling practice is unsatisfactory. A literature review shows that the elements of good modeling practice have long been identified but are widely ignored. The reasons for this might include lack of involvement of decision makers, lack of incentives for modelers to follow good practice, and the use of inconsistent terminologies. As a strategy for the future, we propose a standard format for documenting models and their analyses: transparent and comprehensive ecological modeling (TRACE) documentation. This standard format will disclose all parts of the modeling process to scrutiny and make modeling itself more efficient and coherent.

Scientific articles

Title
Abstract
Introduction
Materials & methods
Results
Discussion
Conclusions

ODD-based model descriptions

Purpose
State variables & scales
Process overview & scheduling
Design concepts
Initialization
Input
Submodels

Table 1. Elements of good modeling practice identified from the literature

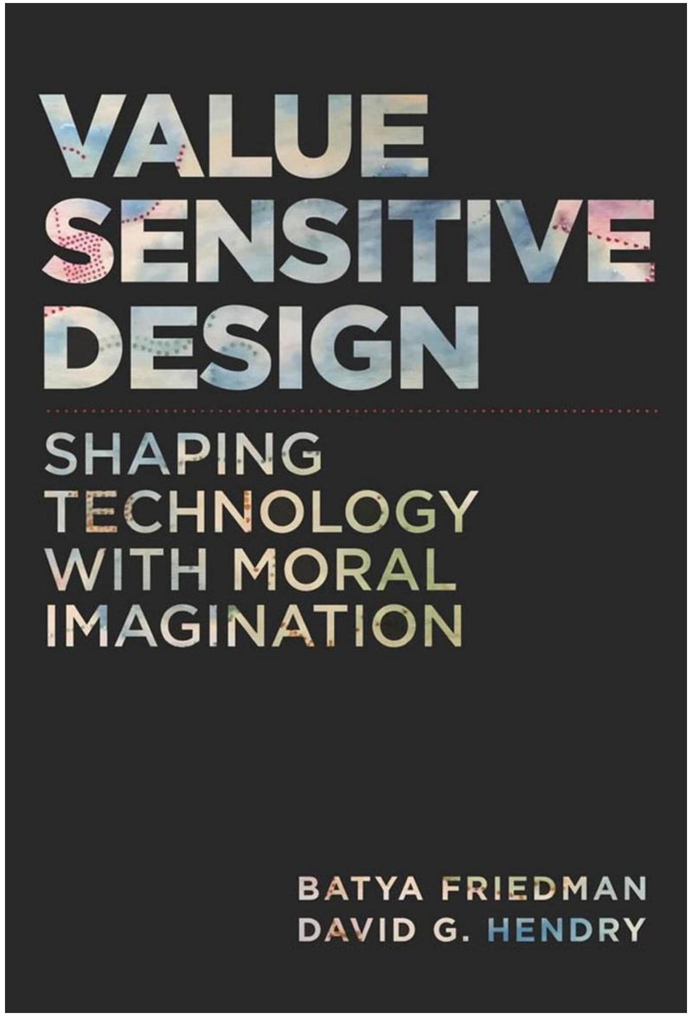
Element	Description
Inclusion of stakeholders	Ongoing communication between stakeholders and modelers during model building, which is a critical factor for the success or failure of modeling projects.
Formulation of objectives	Definition of objectives at the outset of a modeling project, which includes the assessment of the actual management issue, key variables and processes, data availability, kind of outputs required, and how they will inform decisions.
Conceptual model	Formalization of the assumptions about the system and preliminary understanding of its internal organization and operation.
Choice of model approach	Identification of the most appropriate modeling approach in the context of the goal of the modeling project.
Choice of model complexity	Determination of the optimal complexity level for the problem at hand.
Use of multiple models	Application of multiple models to the same problem, which can decrease the uncertainty about the appropriate model approach and main assumptions.
Parameterization and calibration	Determination of model parameters from empirical data or by means of calibration of the model outputs on the basis of data.
Verification	Assurance that the modeling formalism is correct; i.e., that the model has been implemented correctly.
Sensitivity analysis	Systematic testing of the sensitivity of model results to changes in parameter values.
Quantification of uncertainties	Determination of the confidence limits of the model outputs, which is essential for the judgment of the usefulness of the model and its outputs in the contexts of decisions.
Validation	Comparison of model outputs with independent empirical data sets; i.e., data that have not been used for parameterization or calibration of the model.
Peer review	Quality assessment of a model and its analyses by independent experts.
Documentation and transparency	Accurate communication of models, and transparency of the modeling process, which can be achieved through a clear and complete documentation of the model and its evaluation.

Observations

- Female-only data, baseline scenarios and model focused on estimating population growth rates reflect values:
  - *survival*, *reproduction* and *self-sustainability*
- Good practices:
  - *TRAnsparent and Comprehensive model Evaludation (TRACE)*
    - Thoughtful design, correct implementation, testing, understanding and appropriate use.
  - *Overview Design Concepts and Details (ODD)*

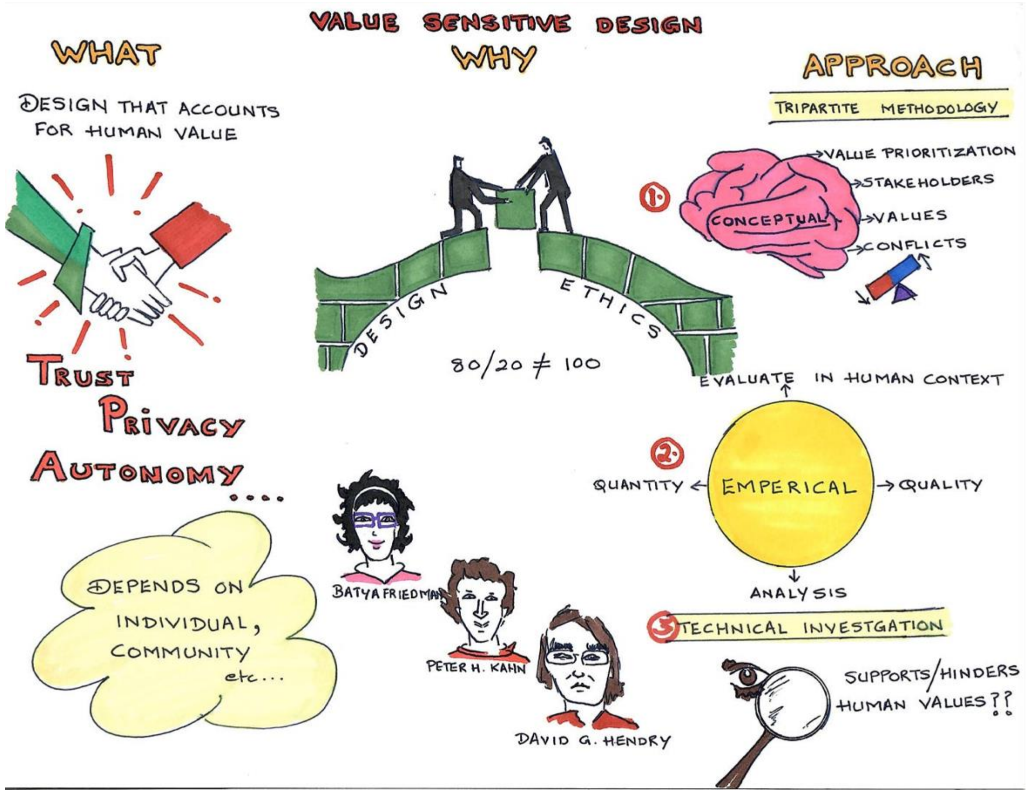
Value Sensitive Design

A Tool for Cyborg Data Practice



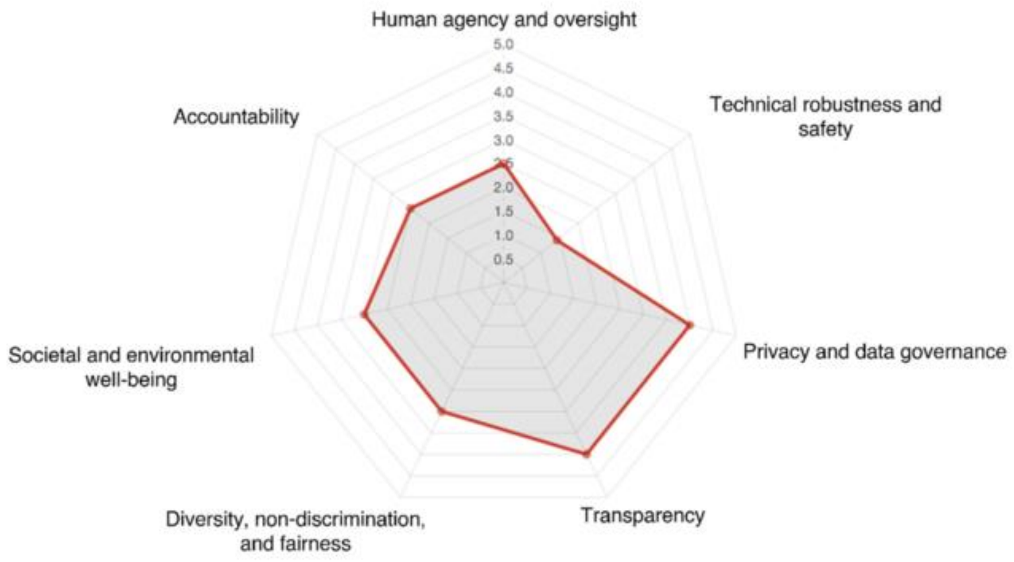
Value Sensitive Design

- Batya Friedman and Peter Kahn (early 90s)
- No such thing as objective, value-neutral technology
- Every technology imbued with and reproduces particular human values.
  - More recently, more-than-human (Friedman and Hendry, 2019)
- Therefore, should engage actively with values throughout design process.



Values and Stakeholders

- Stakeholders - Those who are or will be significantly affected by the technology.
- Values - Anything that stakeholders consider highly important.
  - Emphasis on ethics.
  - Intentionally ambiguous - decided on case-by-case basis.
  - E.g., The 7 ALTAI requirements, Cyborg Ethics of Ambiguity



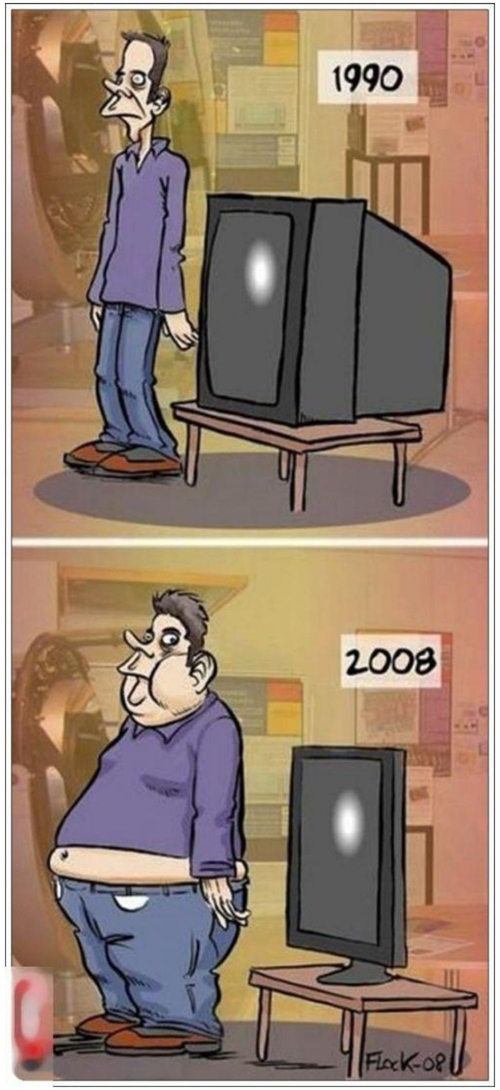
Six Pillars of VSD

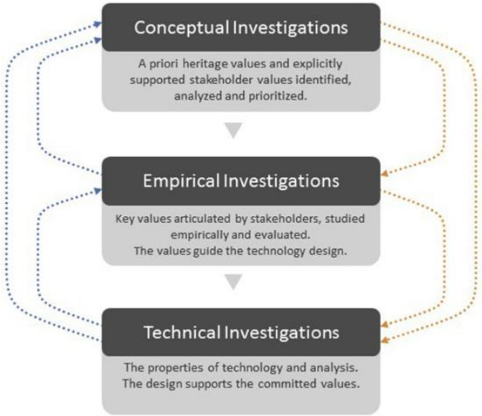
1) Technology and values are mutually constitutive.

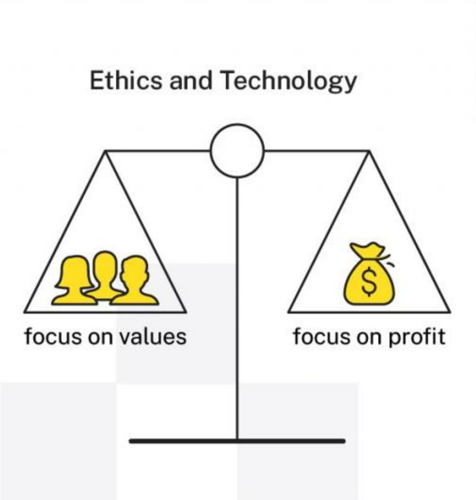
- “We shape our tools, and thereafter our tools shape us.” -Marshall McLuhan

2) Conceptual, empirical and theoretical investigation.

3) Co-existence and competition between human values.







Six Pillars of VSD

4) Co-evolution of technology and social structures.
- Imagine the social effects of large-scale adoption.

5) Long-term lifespan of deployed technology.
- Data drift, feedback, updates, obsolescence, long-term co-evolution (multi-lifespan)

6) Progress, not perfection.

Values First, Then Tech.

The VSD framework emphasizes…

- The values important to each group of primary stakeholders
  - E.g., *fairness*
- The corresponding normative stances about what those values mean.
  - E.g., "*Everyone should be treated equally, regardless of their background,*" or "*People facing greater structural inequality should receive more resources to ensure equitable outcomes*."
- An investigation of technical methods that operationalize these normative stances.
  - E.g., *the requirement to meet certain fairness metric thresholds*.
- Careful consideration of the balancing and/or reconciliation of competing values.
- Sociotechnical context in which the technology is situated, the relationships it mediates, and the social effects its use could have over time.

VSD Envisioning Exercise

Practice VSD concepts on an existing technology.

Exercise

- Choose one of following:
  - Animal Tracking App: https://www.movebank.org/cms/movebank-content/animal-tracker
  - VFRAME Repo: https://github.com/vframeio/vframe, https://vframe.io/about/
  - Oura Ring: https://ouraring.com/
- We will use VSD envisioning cards to stimulate discussion
  - https://vsdesign.org/toolkits/envisioningcards/
  - Ca. 10 mins per slide.

Stakeholders

Stakeholders · Time · Values · Pervasiveness · Multi-lifespan

Direct Stakeholders

People who directly interact with the system are known as *direct stakeholders*. They have unique perspectives, skills, and concerns. In what key roles will individuals interact directly with the system (e.g., for a medical application: intake receptionist, physician, insurance agent)? Direct stakeholders can also include other human and nonhuman entities (e.g., groups of people, companies, birds, sacred mountains).

Create a list of the system's direct stakeholders. For each stakeholder role, note at least one concern specific to that role. You may refer back to these roles throughout the project.

Create

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Stakeholders · Time · Values · Pervasiveness · Multi-lifespan

Indirect Stakeholders

Some people may be affected by a system without directly using it. These people are known as *indirect stakeholders*. In what key roles will individuals be affected by the system while not directly interacting with it (e.g., for a law enforcement database: citizens, bystanders, lawyers)? Indirect stakeholders can also include other human and nonhuman entities (e.g., groups of people, companies, birds, sacred mountains).

Generate a list of 3–5 indirect stakeholders. For each indirect stakeholder role, note at least one concern specific to that role. You may refer back to these roles throughout the project.

Generate

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Values

Stakeholders · Time · **Values** · Pervasiveness · Multi-lifespan

Consider Key Values at Stake

A technology can support certain values and hinder others (e.g., a shared online calendar system can support community, but impinge on privacy). Possible values include (but are not limited to): autonomy, calmness, community, democracy, environmental sustainability, fairness, human dignity, inclusivity, informed consent, justice, privacy, self-efficacy, and trust.

Generate a list of as many potentially implicated values as possible in five minutes (your list may contain some or none of the values suggested here). Then, briefly discuss each of the values on your list.

Generate

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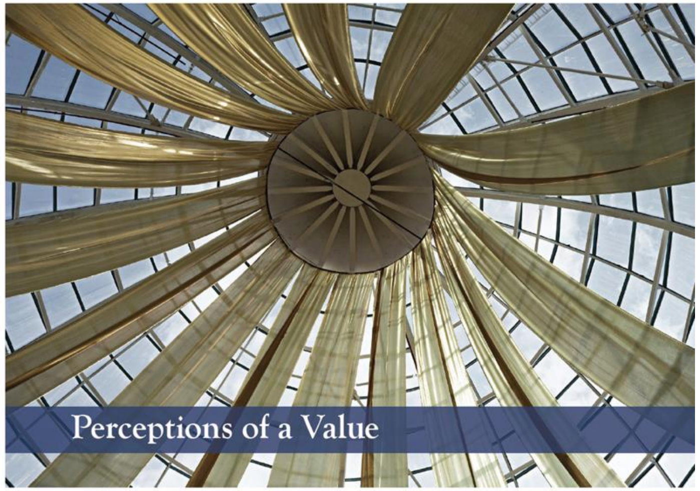

Stakeholders · Time · **Values** · Pervasiveness · Multi-lifespan

Perceptions of a Value

Sometimes stakeholders have different perceptions of the definition of a specific value (e.g., some may define privacy as having control over your information vs. those who define privacy as being left alone).

Investigate a value. For one of key values at stake, consider how each direct stakeholder would define that value as it relates to the system. Identify any substantive differences in stakeholder perceptions.

Investigate

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Time


Long-Term Health and Well-Being
Stakeholders · Time · Values · Pervasiveness · Multi-lifespan
Long-Term Health and Well-Being
Technology may have effects on stakeholders' health and well-being. How might interactions with the system on a daily basis influence health and well-being?
Imagine that the system you are working on has been widely adopted and is part of daily life for direct and indirect stakeholders across society. Reflect upon 3–5 likely ways in which the system influences health and well-being after years of use.
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Imagine

Pervasiveness

Stakeholders · Time · Values · **Pervasiveness** · Multi-lifespan

Political Realities

Different political systems (e.g., democratic, socialist, totalitarian) can influence perceptions and practices that emerge in relation to your system (e.g., unmoderated vs. moderated discussion forums).

Characterize two different political environments in which your system is likely to be deployed. Consider how those political realities may influence how stakeholders in those environments may interact with the features of your system.

Characterize

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